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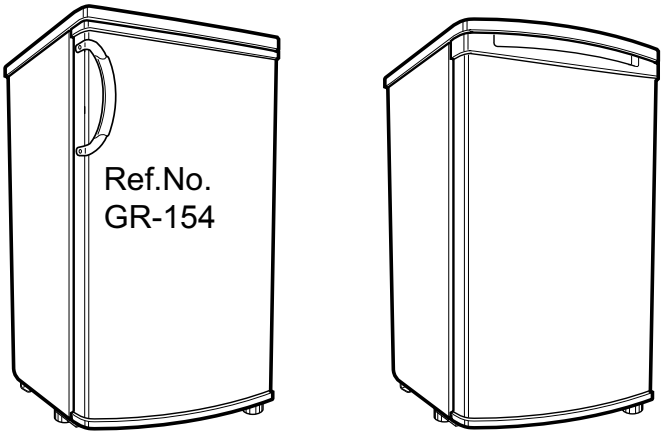
REFRIGERATOR
SERVICE MANUAL

CAUTION
BEFORE SERVICING THE UNIT, READ
THE "SAFETY PRECAUTIONS" IN THIS MANUAL.



MODEL: GR-154***

COLOR : SUPER WHITE

CONTENTS

(Page)

SAFETY PRECAUTIONS **2**

SERVICING PRECAUTIONS **3**

SPECIFICATIONS **4**

PARTS IDENTIFICATION **4**

DISASSEMBLY ..... **5 - 6**

DOOR 5

FREEZER DOOR 5

TOP TABLE 6

FREEZER DOOR, HANDLE 6

THERMOSTAT 6

COMPONENTS **7-8**

CIRCUIT DIAGRAM **8**

TROUBLESHOOTING ..... **9 - 10**

ANOTHER ELECTRIC COMPONENTS **11**

REFRIGERATING CYCLE ..... **12 - 13**

EXPLODED VIEW ..... **15 - 16**

REPLACEMENT PARTS LIST **17**

SAFETY PRECAUTIONS

Please read the following instructions before servicing your refrigerator.

1. Check the set for electric losses.
2. Unplug prior to servicing to prevent electric shock.
3. Whenever testing with power on, wear rubber gloves to prevent electric shock.
4. If you use any kind of appliance, check regular current, voltage and capacity.
5. Don't touch deep-frozen products in the freezer with wet hands. This may cause frostbite.
6. Prevent water from following onto electric elements in the mechanical parts.
7. When tilting the set, remove any materials on the set, especially the thin plates(ex. Glass shelf or books.)
8. Leave the disassembly of the refrigerating cycle to a specialized service center. The gas inside the circuit may pollute the environment.
9. When you discharge the refrigerant, wear the protective safety glasses or goggle for eye safety.
10. When you repair the cycle system in refrigerator, the work area is well ventilated.
    Especially if the refrigerant is R600a, there are no fire or heat sources. (No smoking)

SERVICING PRECAUTIONS

Features of refrigerant (R600a)
- Achromatic and odor less gas.
- Flammable gas and the ignition (explosion) at 494°C.
- Upper/lower explosion limit: 1.8%~8.4%/Vol.

Features of the R600a refrigerator
- Charging of 60% refrigerant compared with a R134a model
- The suction pressure is below 1bar (abs) during the operation.
- Because of its low suction pressure, the external air may flow in the cycle system when the refrigerant leak, and it causes malfunction in the compressor.
- The displacement of compressor using R600a must be at least 1.7 times larger than that of R134a.
- Drier type is XH-9.
- The EVAPORATOR or any other cycle part that has welding joint is hidden in the foam. (If not hidden inside, the whole electric parts must be tested with the LEAKAGE TEST according to the IEC Standard.)
- The compressor has label of the refrigerant R600a.
- Only the Service man must have an access to the system.

Installation place
- Must be well ventilated.
- Must be 20 m^3 or larger.
- Must be no-smoking area.
- No ignitable factors must be present.

Utilities
- Refrigerant cylinder (MAX NET 300g)
- Manometer
- Vacuum pump (600L/min)
- Piercing Clamp
- Quick coupler
- Hoses (5m-1EA, 1m-3EA)
- LOKRING
- Portable Leakage detector (3g/year¯)
- Nitrogen cylinder (for leakage test)
- Concentration gauge

Make sure before Servicing
- Refrigerant
  Confirm the refrigerant by checking Name Plate on innerliner and the label on the compressor.
- If the refrigerant is R600a, you must not weld or apply a heat source.

Air Recharging in Compressor

Before refilling the refrigerant, you must perform the test according to Chapter 5 (TROUBLESHOOTING CHART). When the defects are found, you must discharge the residual refrigerant (R600a) in the outdoor. For discharging the refrigerant R600a, break the narrow portion of tube extension by hand or with a pipe cutter as shown in Figure 1. Leave it for 30min in outside to stabilize the pressure with ambient. Then, check the pressure by piercing the dryer part with piercing pliers. If the refrigerant is not completely discharged, let the refrigerator alone for more 30min in outside.

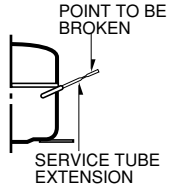


Figure 1

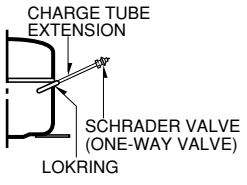


Figure 2

Attach the service tube installed with a Schrader valve (one-way valve) by using the LOKRING (Figure 2). Then, connect the Schrader valve (one-way valve) to the pump that is connected to the discharging hose leading to the outside. When discharging the residual refrigerant, repeat 3 cycle that includes 3min of the pump running->pump off->30sec of the compressor running.

After the refrigerant (R600a) is completely discharged, repair any defective parts and replace the dryer. At any case you must use the LOKRING for connecting or replacing any part in the cycle (No Fire, No Welding). Connect the Schrader valve to pump with the coupler. And then turn the pump on for vacuum state (Figure 3). Let the pump run until the low-pressure gauge indicates the vacuum (gauge pressure 0, absolute pressure -1atm or -760mmHg). Recommended vacuum time is 30 min. Charge the N2 gas in order to check for leakage from welding points and the LOKRING. If leakages are found, repair the defects and repeat the vacuum process.

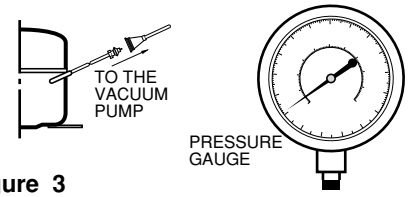


Figure 3

After the system is completely vacuumed, fill it with the refrigerant R600a up to what has been specified at your refrigerator Name Plate. The amount of refrigerant (R600a) must be precisely measured within the error of ±1g by an electron scale (Figure 4).

If you use the manifold connected with both the refrigerant (R600a) cylinder and the vacuum pump simultaneously, make sure the pump valve is closed (Figure 5).

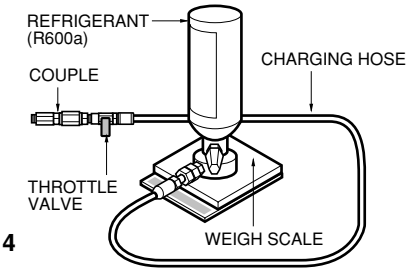


Figure 4

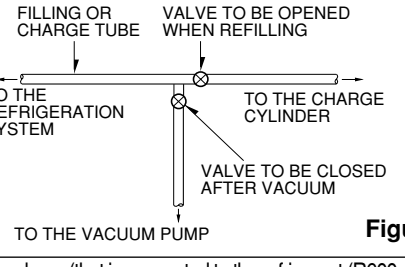

FILLING OR CHARGE TUBE
VALVE TO BE OPENED WHEN REFILLING
TO THE REFRIGERATION SYSTEM
TO THE CHARGE CYLINDER
VALVE TO BE CLOSED AFTER VACUUM
TO THE VACUUM PUMP

Figure 5

Connect the charging hose (that is connected to the refrigerant (R600a) cylinder) to the Schrader valve installed on the service tube. Then, charge the refrigerant (R600a) by controlling the Throttle valve. When you do so, do not fully open the Throttle valve because it may make damage to the compressor. Gradually charge the refrigerant (R600a) by changing open and close the Throttle Valve (5g at each time). The charging hose must use a one-way valve to prevent the refrigerant refluence. Close the Schrader valve cap after the refrigerant (R600a) is completely recharged.

After you completely recharge the refrigerant (R600a), perform the leakage test by using a portable leakage detector or soapy water.
Test the low pressure (suction) parts in compressor off time and high pressure parts in compressor on time. If the leakages are found, restart from the refrigerant (R600a) discharging process and repairs defects of leaks.

After the leakage test, check the temperature of each parts of the cycle. Check with hands if the CONDENSER and the case (HOT-LINE pipe) that is contacted to the door gasket are warm. Confirm that frost is uniform distributed on the surface of the freezer room and the back wall of fridge room.

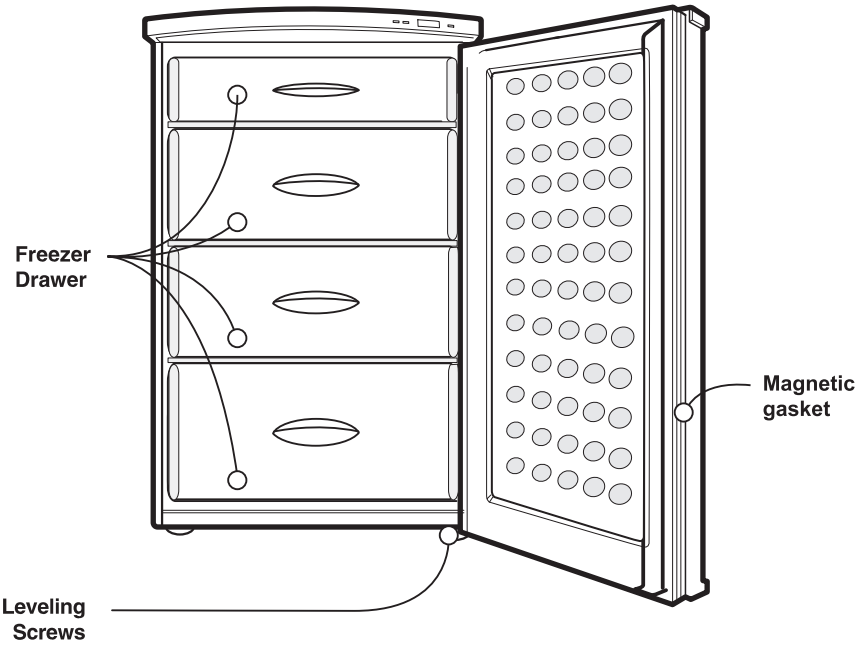
1. SPECIFICATIONS

1-1 GR-154

ITEMS		SPECIFICATIONS
STORAGE CAPACITY	FREEZER	100
	TOTAL	100
DIMENSIONS (mm)		550 (W) X 600 (D) X 850 (H)
NET WHIGHT(kg)		40
TEMPERATURE CONTROL		BUTTON
DEFROSTING SYSTEM		MANUAL
OUT CASE		Coated Steel sheet
INNER CASE		ABS
INSULATION		CYCLOPENTANE

ITEMS	SPECIFICATIONS
DRAWER	4EA
ICE TRAY	YES
COMPRESSOR	P.T.C Starting Type
CONDENSER	Wire Condenser
REFRIGERANT	R600a (40g)
LUBRICANT OIL	HTS 60 MT(210cc)

2. PARTS IDENTIFICATION



NOTE : This is a basic model. The shape of refrigerator is subject to change.

3. DISASSEMBLY

PRECAUTION

1. First unplug the appliance.
2. Remove foods and accessories like shelves or trays which are not fixed in the refrigerator.
3. Carefully lay the appliance on a cushion like packing material to avoid the damage of refrigeration circuit.
4. Use '+' driver or spanner to fix or remove the bolts.

2. Remove the LEG ③.

▶ Reversible

4. Before refitting the door, swap the Hinge Cap ④ by pulling it out from its current location and repositioning it on the other side of the door. Care should be taken not to damage the adjacent surfaces when removing the Hinge Cap.
5. Unscrew the Upper Hinge pin (U) ⑤ and screw it into the opposite side hole.
6. After refitting the door, fix the Lower Hinge(L) in the opposite side by using 2xBOLTS.
7. Fix the Leg.
8. Carefully place the appliance in an upright position. Adjust the Leveling screw to make sure the appliance is steady and check that the door opens and closes properly.

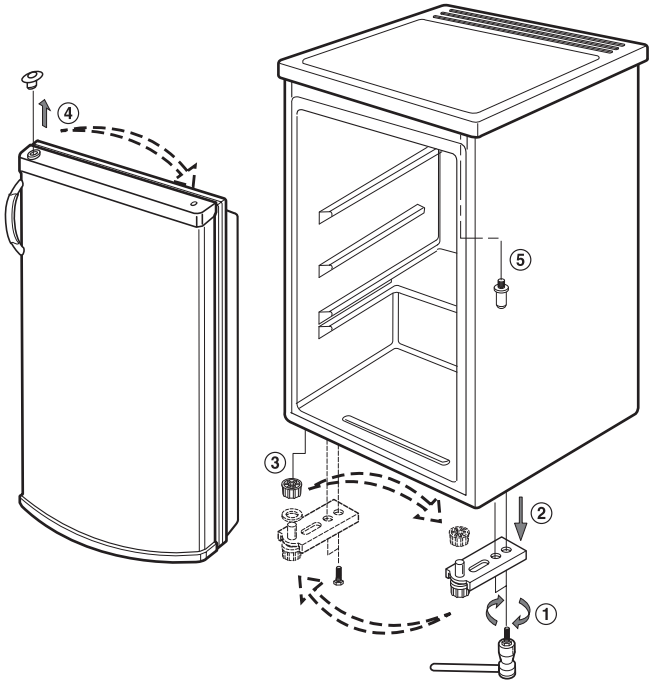


Figure 6

4. COMPONENTS

1. COMPRESSOR

1) Role

The compressor intakes low temperature and low pressure gas evaporated from Evaporator of the Refrigerator, and condenses this gas to high temperature and high pressure gas, and then plays delivering role to Condenser.

2) Composition

The Compressor is Composed of Compressor Apparatus compressing gas, Compressor Motor moving Compressor Apparatus and Case protecting Compressor Apparatus and Motor. There are PTC-Starter, and Over Load Protector (OLP) in the Compressor outside. On the other hand, because the Compressor consists of 1/1000mm processing precision components and is sealed after production in absence of dust or humidity, deal and repair with care.

3) Note for Usage

(1) Be careful not to allow over-voltage and over current.

(2) No Strike
If applying forcible power or strike (dropping or careless dealing), poor operation and noise may occur

(3) Use proper electric components appropriate to the Compressor.

(4) Note to Keep Compressor.
If Compressor gets wet in the rain and rust in the pin of Hermetic Terminal, the result may be poor operation and poor contact may cause.

(5) Be careful that dust, humidity, and flux welding don't inflow in the Compressor inside in replacing the Compressor. Dust, humidity, and flux due to welding which inflows to Cylinder may cause lockage and noise.

2. PTC-STARTER

1) Composition of PTC-Starter

(1) PTC (Positive Temperature Coefficient) is a no-contact semiconductor starting device which uses ceramic material and this material consists of BaTiO3.

(2) The higher the temperature is, the higher becomes the resistance value. These features are used as starting device for the Motor.

2) Role of PTC-Starter

(1) PTC is attached to Hermetic Compressor used for Refrigerator, Show Case and starts Motor.

(2) Compressor for household refrigerator applies to single-phase induction Motor.
For normal operation of the single-phase induction motor, in the starting operation flows in both main coil and sub-coil. After the starting is over, the current in subcoil is cut off. The proper features of PTC play all the above roles. So, PTC is used as a motor starting device.

3) PTC-Applied Circuit Diagram According to Starting Method for the Motor

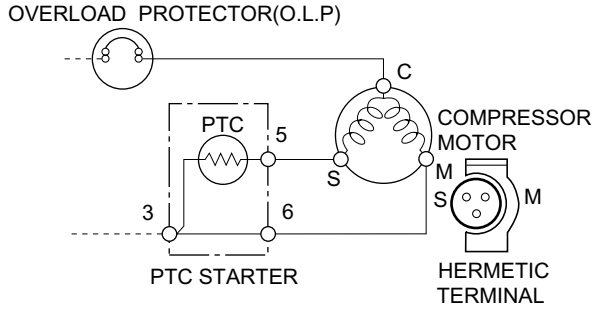


Figure 11

4) Motor Restarting and PTC Cooling

(1) For restarting after power off during normal Compressor Motor operation, plug the power cord after 5 min. for pressure balance of Refrigerating Cycle and PTC cooling.

(2) During normal operation of the Compressor Motor, PTC elements generate heat continuously. Therefore, if PTC isn't cooled for a while after the power has been shut off, Motor can't operate again.

5) Relation of PTC-Starter and OLP

(1) If the power is off during operation of Compressor and the power is on before the PTC is cooled, (instant shut- off within 2 min. or reconnect a power plug due to misconnecting), the PTC isn't cooled and a resistance value grows. As a result, current can't flow to the sub- coil and the Motor can't operate and the OLP operates by flowing over current in only in the main-coil.

(2) While the OLP repeats on and off operation about 3-5 times, PTC is cooled and Compressor Motor performs normal operation.
If OLP doesn't operate when PTC is not cooled, Compressor Motor is worn away and causes circuitshort and fire. Therefore, use a properly fixed OLP without fail.

6) Note to Use PTC-Starter

(1) Be careful not to allow over-voltage and over-current.

(2) No Strike
Don't apply a forcible power or strike.

(3) Keep apart from any liquid.
If liquid such as oil or water away enter the PTC, PTC materials it may break due to insulation breakdown of the material itself.

(4) Don't change PTC at your convenience.
Don't disassemble PTC and mold. If the exterior to the PTC-starter is damaged, resistance value is altered and it may cause poor starting of the compressor motor may cause.

(5) Use a properly fixed PTC.

3. OLP (OVER LOAD PROTECTOR)

1) Definition of OLP

(1) OLP (OVER LOAD PROTECTOR) is attached to the Hermetic Compressor and protects the Motor by cutting off current in Compressor Motor in case of over-rising temperature by Bimetal in the OLP.

(2) When over-voltage flows to Compressor motor, the Bimetal works by heating the heater inside the OLP, and the OLP protects Motor by cutting off current which flows to the Compressor Motor.

2) Role of the OLP

(1) The OLP is attached to the Hermetic Compressor used for the Refrigerator and Show Case and prevents the Motor Coil from being started in the Compressor.

(2) Do not turn the Adjust Screw of the OLP in any way for normal operation of the OLP.(Composition and connection Diagram of OLP)

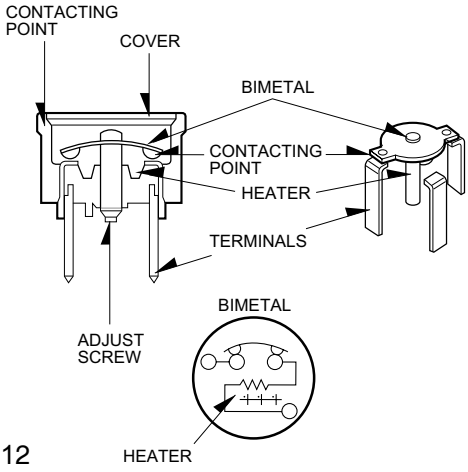
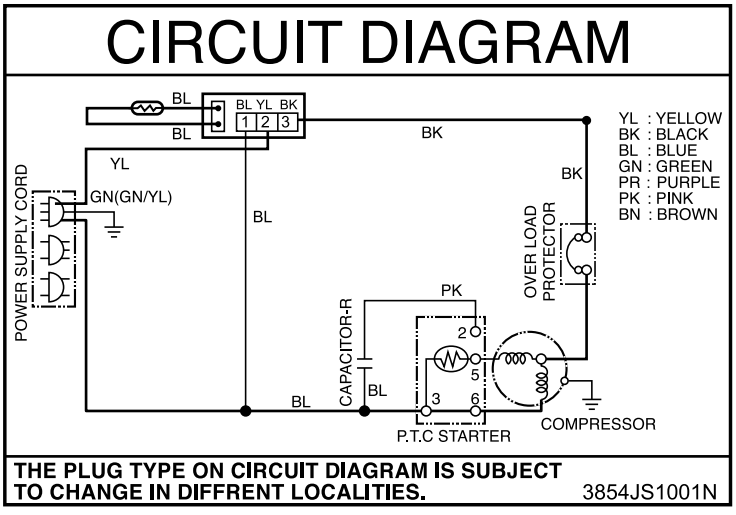


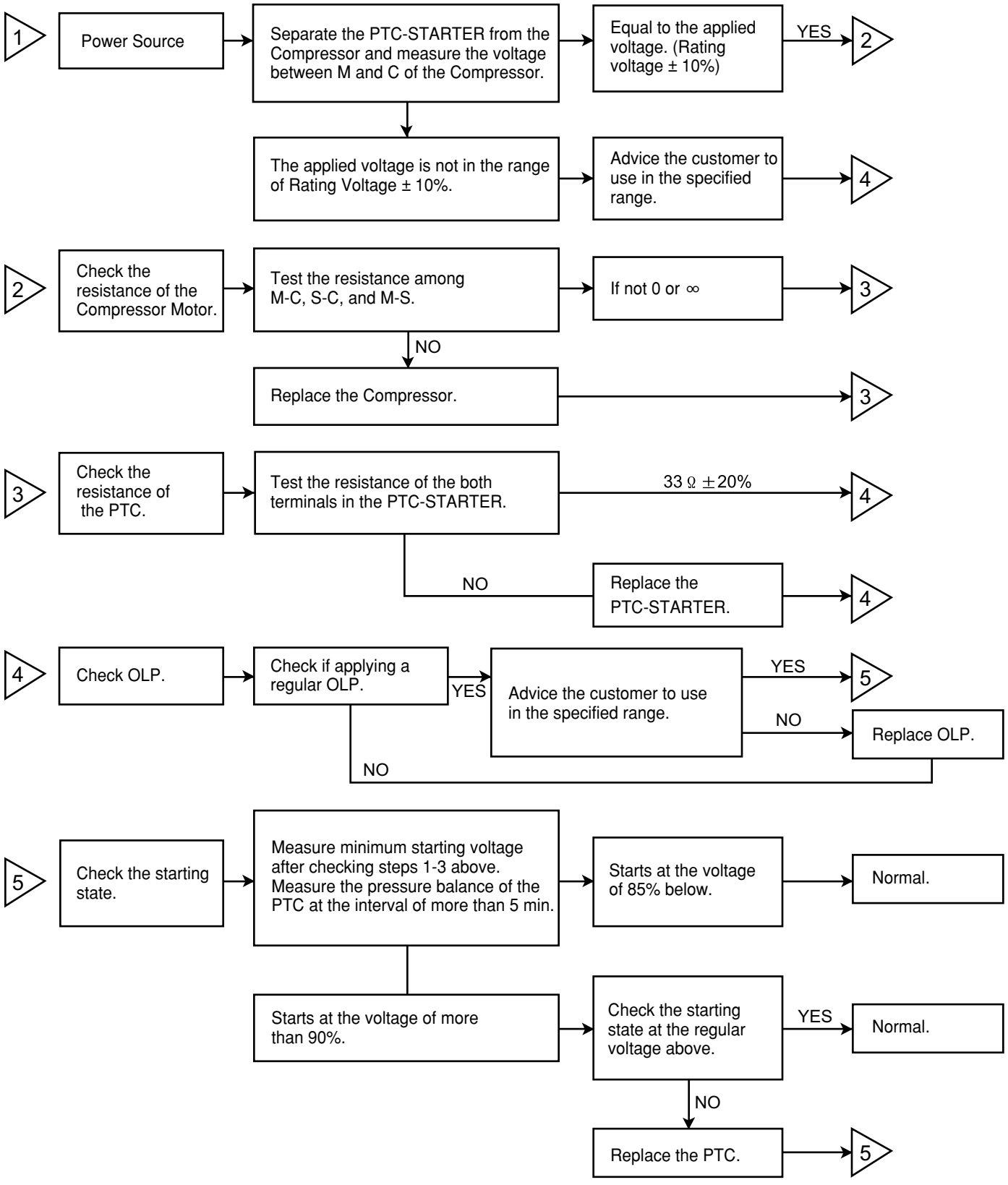
Figure 12

4. CIRCUIT DIAGRAM

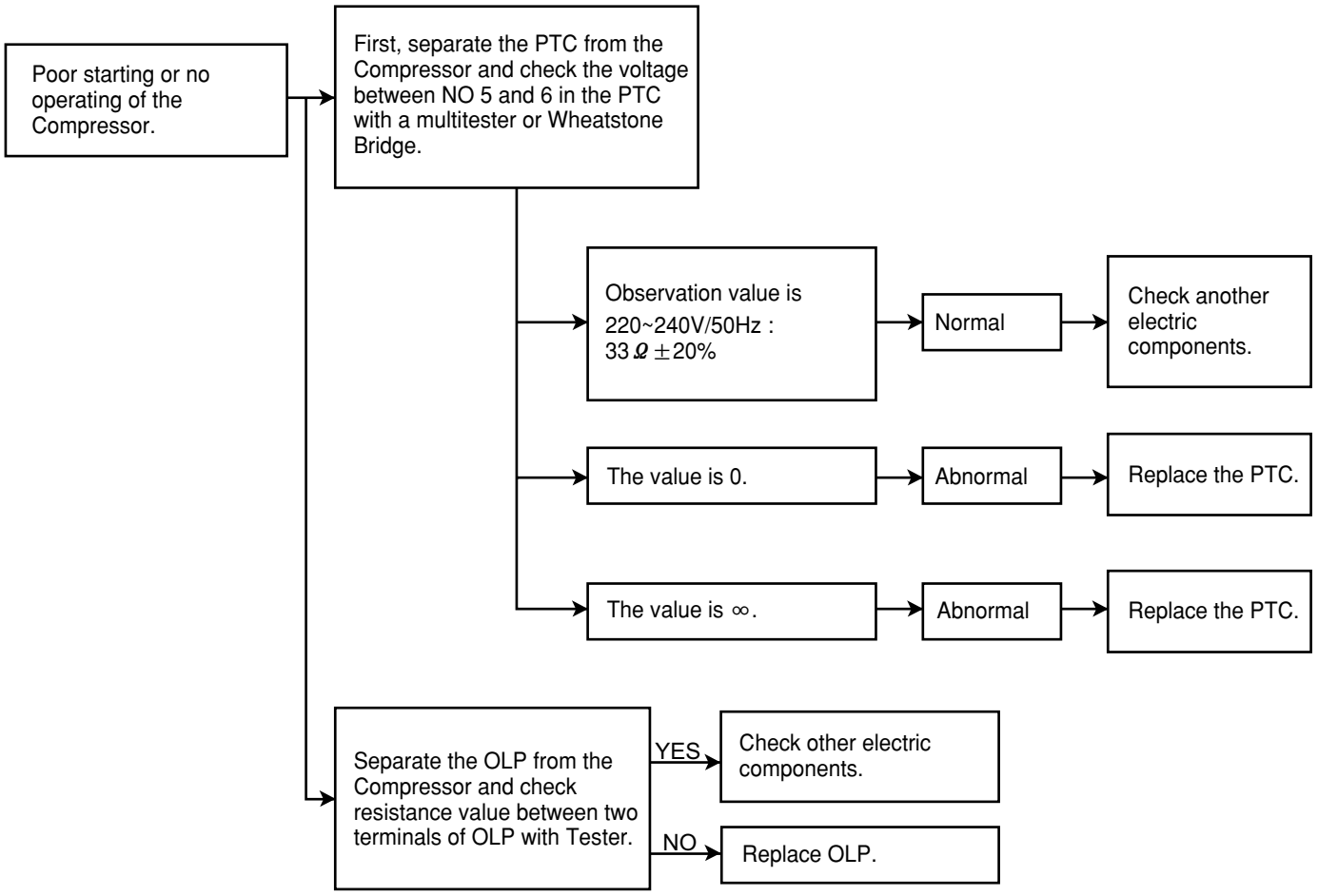


TROBLESHOOTING

COMPRESSOR AND ELECTRIC COMPONENTS

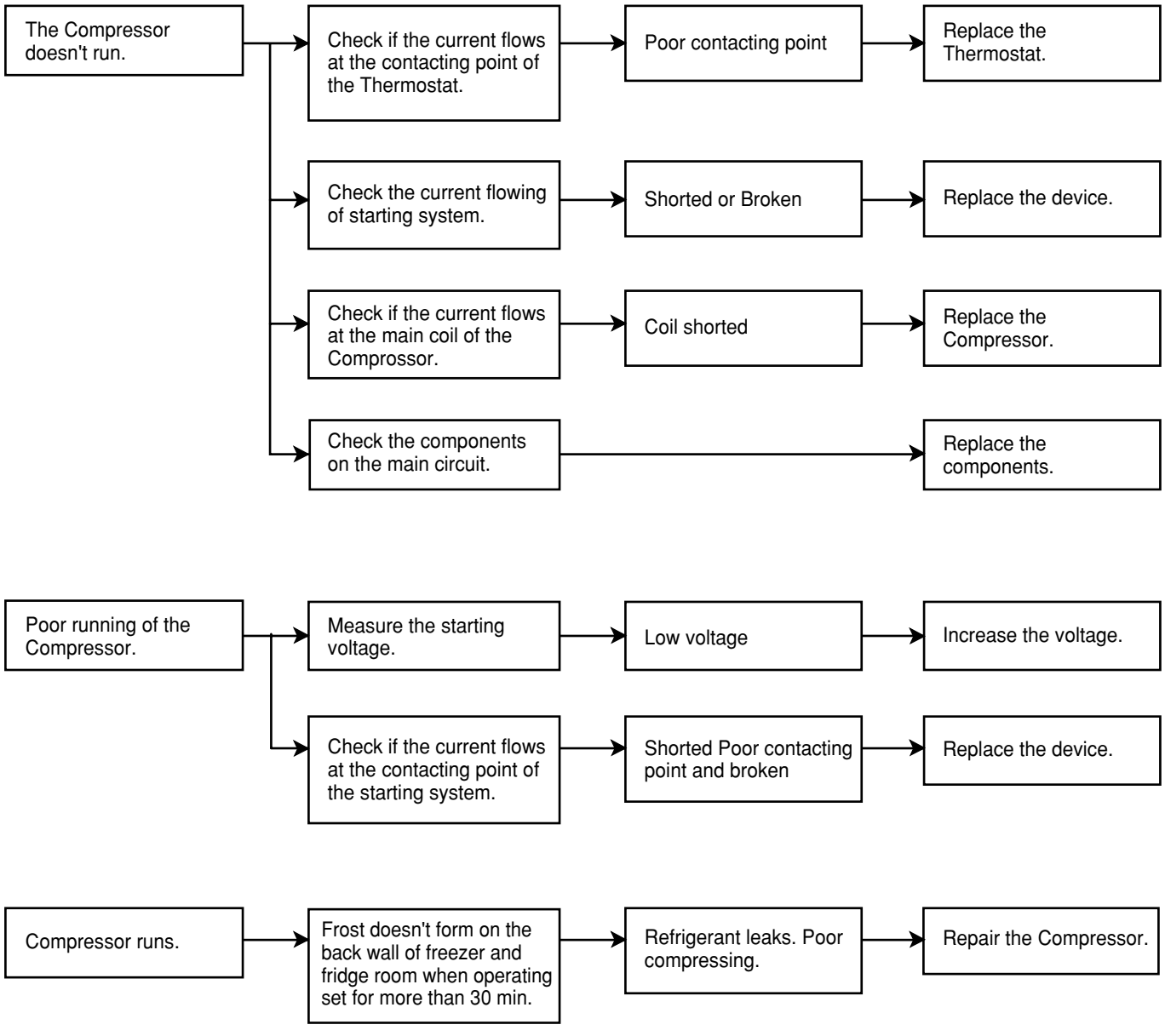

1
Power Source
Separate the PTC-STARTER from the Compressor and measure the voltage between M and C of the Compressor.
Equal to the applied voltage. (Rating voltage ± 10%)
YES
2
The applied voltage is not in the range of Rating Voltage ± 10%.
Advice the customer to use in the specified range.
4
2
Check the resistance of the Compressor Motor.
Test the resistance among M-C, S-C, and M-S.
If not 0 or ∞
3
NO
Replace the Compressor.
3
3
Check the resistance of the PTC.
Test the resistance of the both terminals in the PTC-STARTER.
33 Ω ±20%
4
NO
Replace the PTC-STARTER.
4
4
Check OLP.
Check if applying a regular OLP.
YES
Advice the customer to use in the specified range.
YES
5
NO
Replace OLP.
NO
5
Check the starting state.
Measure minimum starting voltage after checking steps 1-3 above. Measure the pressure balance of the PTC at the interval of more than 5 min.
Starts at the voltage of 85% below.
Normal.
Starts at the voltage of more than 90%.
Check the starting state at the regular voltage above.
YES
Normal.
NO
Replace the PTC.
5

PTC


Poor starting or no operating of the Compressor.
First, separate the PTC from the Compressor and check the voltage between NO 5 and 6 in the PTC with a multitester or Wheatstone Bridge.
Observation value is 220~240V/50Hz : 33Ω ±20%
Normal
Check another electric components.
The value is 0.
Abnormal
Replace the PTC.
The value is ∞.
Abnormal
Replace the PTC.
Separate the OLP from the Compressor and check resistance value between two terminals of OLP with Tester.
YES
Check other electric components.
NO
Replace OLP.

ANOTHER ELECTRIC COMPONENTS

▼ No Cooling


The Compressor doesn't run.
Check if the current flows at the contacting point of the Thermostat.
Poor contacting point
Replace the Thermostat.
Check the current flowing of starting system.
Shorted or Broken
Replace the device.
Check if the current flows at the main coil of the Comprossor.
Coil shorted
Replace the Compressor.
Check the components on the main circuit.
Replace the components.
Poor running of the Compressor.
Measure the starting voltage.
Low voltage
Increase the voltage.
Check if the current flows at the contacting point of the starting system.
Shorted Poor contacting point and broken
Replace the device.
Compressor runs.
Frost doesn't form on the back wall of freezer and fridge room when operating set for more than 30 min.
Refrigerant leaks. Poor compressing.
Repair the Compressor.

REFRIGERATING CYCLE

▼ Troubleshooting chart

DEFECT	EFFECT	CAUSE	REMEDY
SYSTEM PARTIALLY OR COMPLETELY OUT OF REFRIGERANT CHARGE	Freezer and fridge room do not frost even though motor-compressor runs continually.	An empty refrigerant system indicates a leakage of isobutane (R600a). This loss is generally to be looked for at the soldering points connecting the various components or in an eventual hole in the evaporator made by the user.	Leakage must be eliminated by resoldering the defective point .
EXCESSIVELY FULL	This defect is indicated by the presence of water outside the refrigerator near the motor caused by formations of ice on the return tube.	If in the refrigerant system a quantity of R600a is introduced which is greater than that indicated, the excess gas does not terminate its expansion in the evaporator but proceeds into the return tube.	The system must be emptied and subsequently refilled introducing the correct quantity of R600a.
HUMIDITY IN THE SYSTEM	This defect is indicated by the partial frosting of the freezer room and by continual defrosting cycles determined by the interruption of the flow of gas on the evaporator. The motor compressor keeps running.	The refrigerant system is humid when there is a small percentage of water present, which, not completely retained by the dehydrator filter, enters into circulation with isobutane and freezes at the capillary exit in the evaporator.	The system must be emptied and then refilled after eliminating the humidity.
PRESENCE OF AIR IN THE SYSTEM	Poor performance of the refrigerant system which is indicated on the evaporator with a slight frost which does not freeze and an excessive overheating of the condenser and motor-compressor.	There is air in the refrigerating system when during the filling phase vacuum is not effected or it is not adequately done.	Group must be drained and subsequently refilled after carefully creating vacuum.
BLOCKED CAPILLARY	Because of the lack of circulation isobutane in the system, there is no frosting of the evaporator, while a slight overheating of the first spiral of the condenser is noted.	Impurities contained in isobutane or in the components of the refrigeration system before assembly and not retained by the filter can obstruct the capillary.	Do away with the refrigerator.
MOTOR-COMPRESSOR DOSE NOT COMPRESS	No frost forms on the evaporator, even if the motor-compressor is running.	In this case there is a mechanical failure in the diaphram valves which remaining continually open, do not permit the compressor to operate. Consequentely, isobutane does not circulate in the system.	The motor-comprossor must be replaced and then proceed with refilling.
NOISY MOTOR-COMPRESSOR	In case of mechanical failure in the motor-compressor there in an excessive noise when the system is functioning. In case a suspension spring is unhooked, banging will be heard and there will be especially strong vibrations when the system starts up and stops.	The cause of the excessive noise is normally to be sought for in a mechanical breakdown, and only rarely in the unhooking of one of the suspension springs.	The motor-compressor must be replaced and then proceed with the refilling.

▼ **General Control of Refrigerating Cycle**

NO.	ITEMS	CONTENTS AND SPECIFICATIONS	REMARKS
1	WELDING ROD	(1) H 30 • Chemical Ingredients Ag: 30%, Cu: 27%, Zn: 23%, Cd: 20% • Brazing Temperature: 710~840°C (2) Bcup-2 • Chemical Ingredients Cu: About 93% P: 6.8~7.5% The rest: within 0.2% • Brazing Temperature: 735~840°C	• Recommend H34 containing 34% Ag in the Service Center.
2	FLUX	• Ingredients and how to make Borax 30% Borax 35% Fluoridation kalium: 35% Water: 4% Mix the above ingredients and boil until they are transformed into liquid.	• Make amount for only day. Holding period: 1 day • Close the cover of container to prevent dust putting in the FLUX. • Keep it in a stainless steel container.
3	LOKRING (Figure 15, 16)	(1) Both of the tube is inserted up to the stop. (2) Both of the LOKRING is pushed up to the stop (3) The bending point is not too close to the joint ending. (4) During the assembly it is important that both ends remain completely within the joint.	• For a hermetically sealed metal/metal connection, the tube ends have to be clean. • LOKPREP is distributed all of out-surface of the tube ends.
4	DRIER ASM	(1) Assemble the drier within 30min. after unpacking. (2) Keep the unpacked drier at the temperature of 80~100°C.	• Don't keep the drier in a outdoors because humidity damages to it.
5	VACUUM	(1) When measuring with pirant Vacuum gauge the charging M/C, vacuum degree is within 1 Torr. (2) If the vacuum degree of the cycle inside is 10 Torr. below for low pressure and 20 Torr. for high pressure, it says no vacuum leakage state. (3) Vacuum degree of vacuum pump must be 0.05 Torr. below after 5 min. (4) Vacuum degree must be same to the value described item (2) above for more than 20 min.	• Apply M/C Vacuum Gauge without fail. • Perform vacuum operation until a proper vacuum degree is built up. • If a proper vacuum degree isn't built up, check the leakage from the Cycle Pipe line part and Quick Coupler Connecting part.
6	DRY AND AIR NITROGEN GAS	(1) The pressure of dry air must be more han 12~16kg/cm^2 (2) Temperature must be more than -20~-70°C. (3) Keep the pressure at 12~6kg/cm^2 also when substituting dry air for Nitrogen Gas.	
7	NIPPLE AND COUPLER	(1) Check if gas leaks with soapy water. (2) Replace Quick Coupler in case of leakage.	• Check if gas leaks from joint of the Coupler.
8	PIPE	• Put all Joint Pipes in a clean box and cover tightly with the lid so that dust or humidity is not inserted.	

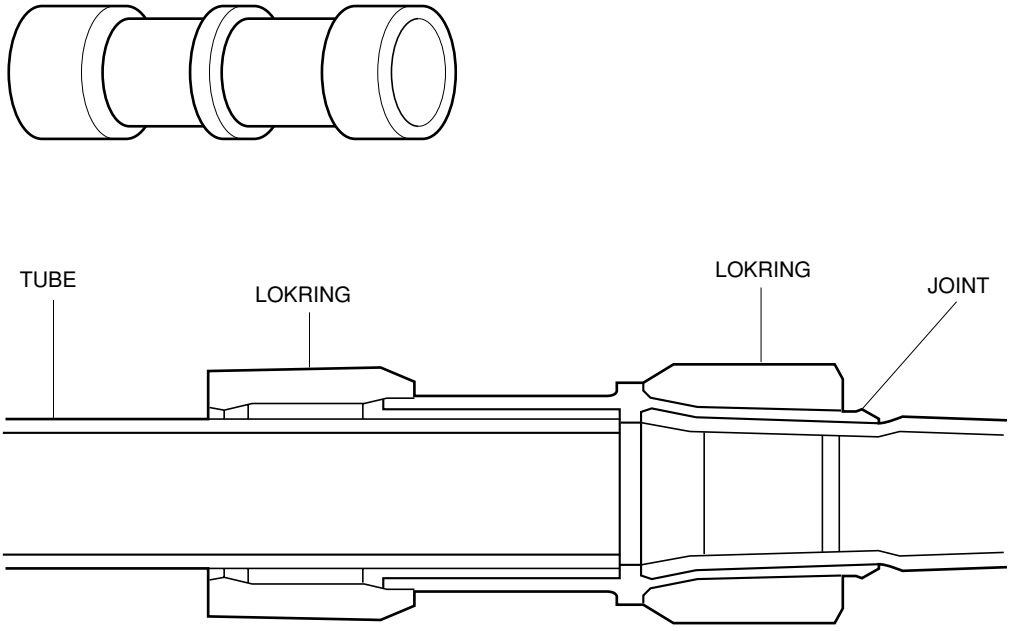


Figure 15. LOKRING

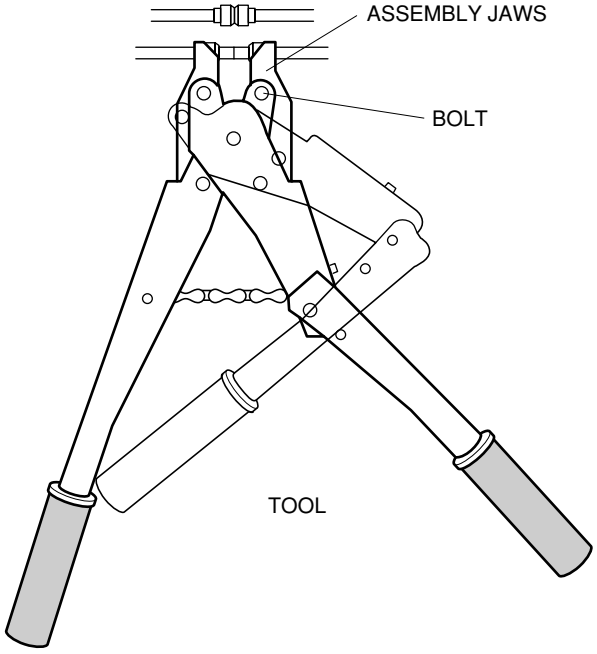
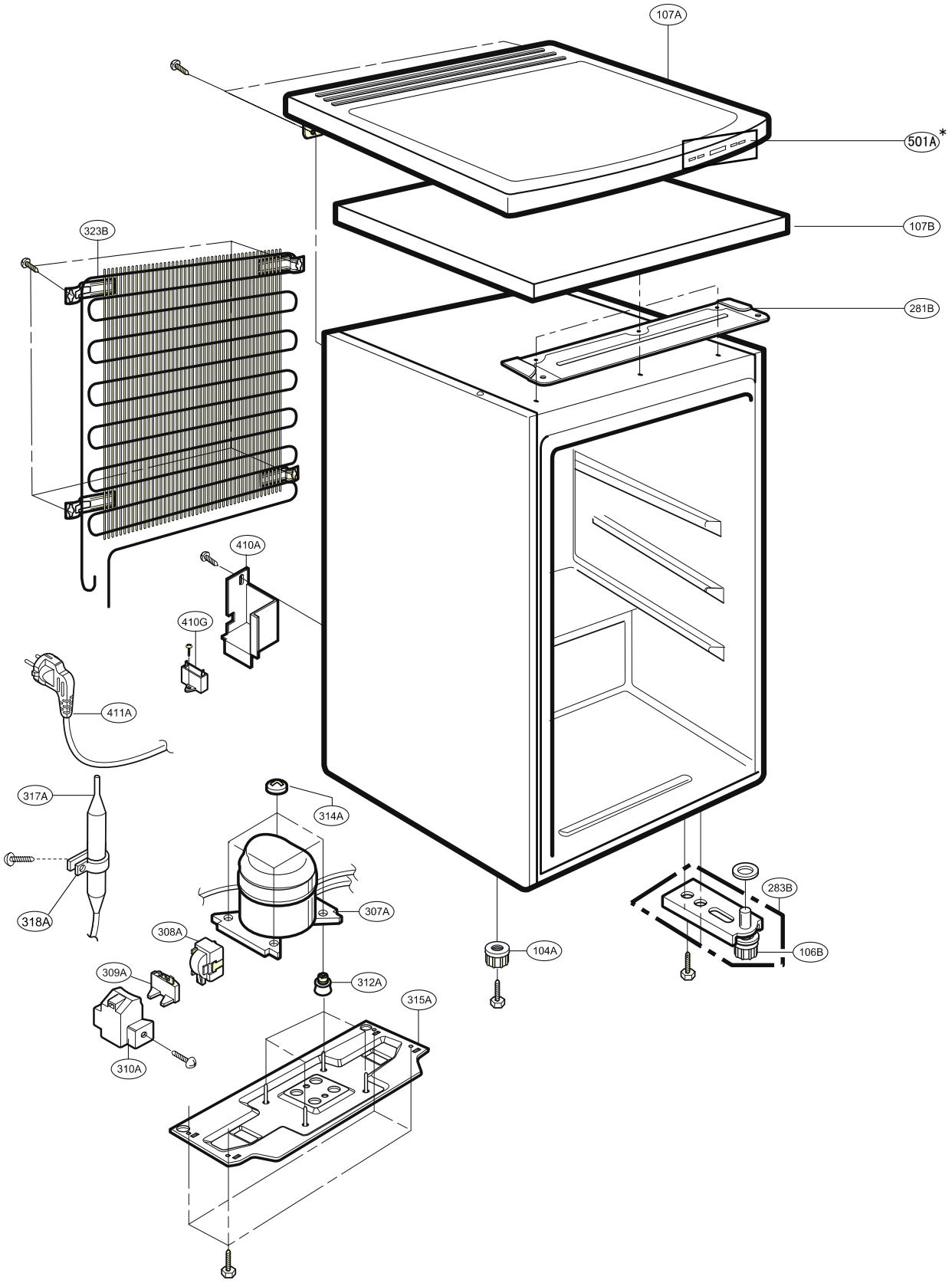


Figure 16. LOKRING TOOL

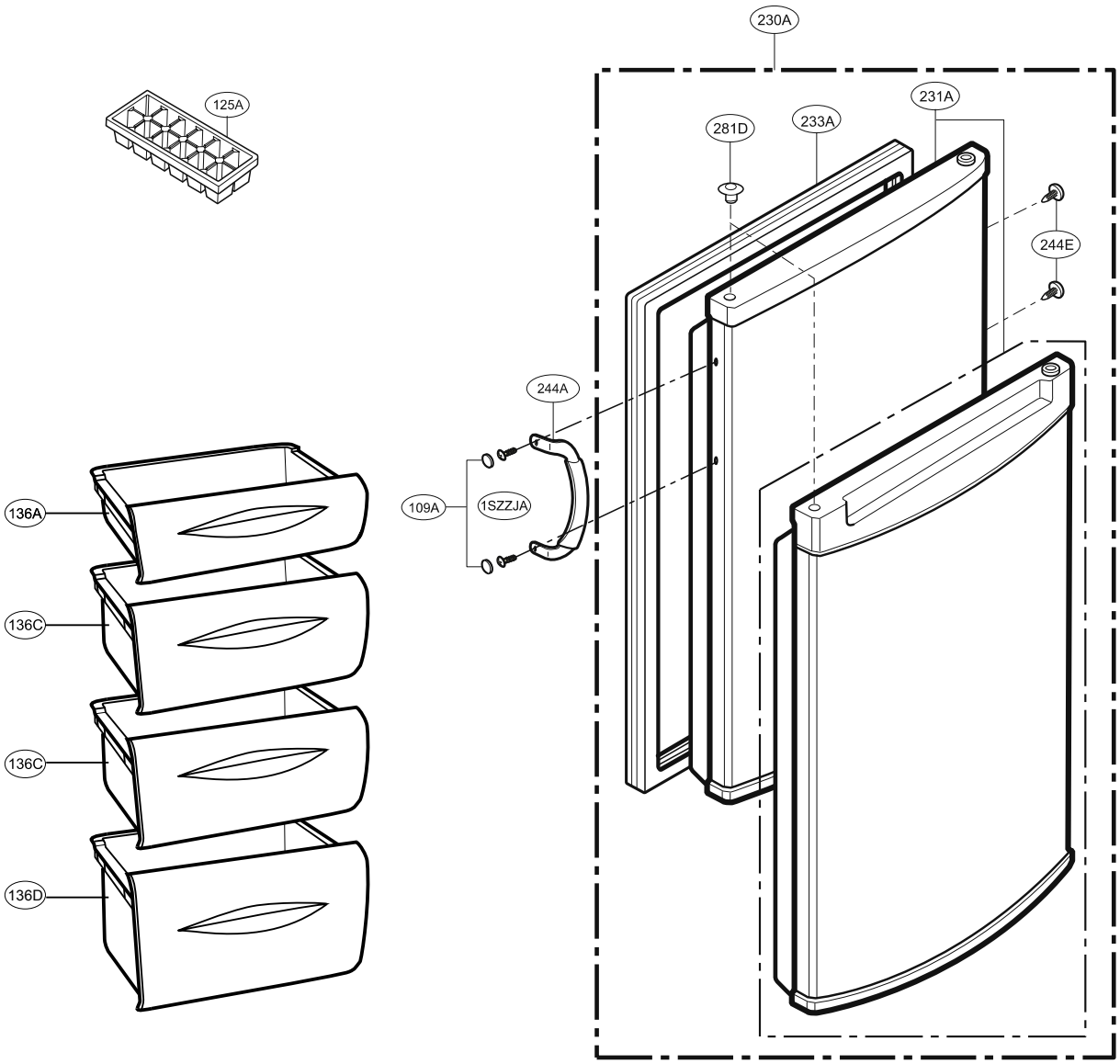
5. EXPLODED VIEW

NOTE: 1. The shape of parts are subject to change in different localities.



NOTE: 1. The shape of parts are subject to change in different localities.

* : Optional parts



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